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AMENDMENT TRANSMITTAL **PATENT**

Application No.: 10/674,892
Filing Date: September 29, 2003
First Named Inventor Frederick Hausenbak
Examiner's Name: Elve, Maria Alexandria
Art Unit: 1725
Attorney Docket No.: 42P15995

____ An Amendment After Final Action (37 CFR 1.116) is attached and applicant(s) request expedited action.
X Charge any fee not covered by any check submitted to Deposit Account No. 02-2666.
X Applicant(s) hereby request and authorize the U.S. Patent and Trademark Office to (1) treat any concurrent or future reply that requires a petition for extension of time as incorporating a petition for extension of time for the appropriate length of time and (2) charge all required fees, including extension of time fees and fees under 37 CFR 1.16 and 1.17, for any concurrent or future reply to Deposit Account No. 02-2666.
____ Applicant(s) claim small entity status (37 CFR 1.27).

ATTACHMENTS

____ Preliminary Amendment
____ Amendment/Response with respect to Office Action
____ Amendment/Response After Final Action (37 CFR 1.116) (reminder: consider filing a Notice of Appeal)
____ Notice of Appeal
____ RCE (Request for Continued Examination)
____ Supplemental Declaration
____ Terminal Disclaimer (reminder: if executed by an attorney, the attorney must be properly of record)
____ Information Disclosure Statement (IDS)
____ Copies of IDS citations
____ Petition for Extension of Time
____ Fee Transmittal Document (that includes a fee calculation based on the type and number of claims)
____ Cross-Reference to Related Application(s)
____ Certified Copy of Priority Document
X Other: Appeal Brief Under 37 C.F.R. 41.37(a)
____ Other:
X Check(s)
X Postcard (Return Receipt)

SUBMITTED BY:

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Attorney's Docket No.: 42P15995 PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of:	)	Examiner: Elve, Maria Alexandra
Frederick Haubensak	)	Art Group: 1725
Application No.: 10/674,372	)	Confirmation No.: 5201
Filed: September 29, 2003	)	
For: WAFER DEFECT REDUCTION BY SHORT PULSE LASER ABLATION	)	

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APPEAL BRIEF UNDER 37 C.F.R. § 41.37(a)

This is an appeal to the Board of Patent Appeals and Interferences, following the Notice of Appeal received on November 19, 2007, appealing the decision of the Examiner dated August 21, 2007 which finally rejected claims 7, 10-23 and 25-29 in the above-identified application. This Appeal Brief is hereby submitted pursuant to 37 C.F.R. § 41.37(a).

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Date

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I. REAL PARTY IN INTEREST

The real party in interest is the assignee of the full interest in the invention, Intel Corporation, 2200 Mission College Boulevard, Santa Clara, California 95052.

II. RELATED APPLEALS AND INTERFERENCES

To the best of Appellants' knowledge, there are no appeals or interferences related to the present appeal that will directly affect, be directly affected by, or have a bearing on the Board's decision in the instant appeal.

III. STATUS OF THE CLAIMS

Claims 7, 10-23 and 25-29 are pending in the application and were finally rejected in an Office Action mailed August 21, 2007. Claims 7, 10-23 and 25-29 are the subject of this appeal. A copy of claims 7, 10-23 and 25-29 as they stand on appeal are set forth in the Claims Appendix.

IV. STATUS OF AMENDMENTS

No amendments have been submitted subsequent to the Final Office Action mailed August 21, 2007.

V. SUMMARY OF CLAIMED SUBJECT MATTER

Appellants' invention as claimed in claims 7, 10-23 and 25-29 is directed to the removal of particle defects on a wafer, and particularly to method and apparatus to ablate the particle defects with a short pulse laser beam. The ablating causes the particle defect to undergo an explosive evaporation, which comprises evaporation and fragmentation of the particle defect. A

particle defect detector is included to detect particle defects on the wafer surface (Claims 17-23). A surface scanning is included to gather data about location and physical properties of particle defects (Claims 25-29).

Claim 7 recites a method comprising: focusing a short pulse laser beam onto a particle defect on a wafer surface (Abstract; and Page 1, Col. 2, line 30); and ablating the particle defect with the short pulse laser beam (Abstract; and Page 1, Col. 2, line 31), wherein the ablating causes the particle defect to undergo an explosive evaporation (Abstract; Page 1, Col. 2, line 31; Page 1, Col. 2, line 38; and Page 2, Col. 1, line 62), the explosive evaporation comprising evaporation (Page 2, Col. 1, line 59; and Page 2, Col. 2, line 3) and fragmentation (Page 2, Col. 1, line 59; elements 212 of Fig. 2D; and Page 2, Col. 2, line 37) of the particle defect.

Claim 17 recites a system comprising: a particle defect detector (element 402 of Figs. 4A and Fig. 4B; Page 3, Col. 2, line 10; Page 3, Col. 2, line 46; and Page 4, Col. 1, line 3) to detect particle defects on a wafer surface; and a particle defect ablator (element 404 of Figs. 4A and Fig. 4B; Page 3, Col. 2, line 11; and Page 3, Col. 2, line 35) including a short pulse laser to cause explosive evaporation (Abstract; Page 1, Col. 2, line 31; Page 1, Col. 2, line 38; and Page 2, Col. 1, line 62) of the particle defects, the explosive evaporation comprising evaporation (Page 2, Col. 1, line 59; and Page 2, Col. 2, line 3) and fragmentation (Page 2, Col. 1, line 59; elements 212 of Fig. 2D; and Page 2, Col. 2, line 37) of the particle defects.

Claim 25 recites a method comprising: scanning the surface of a wafer (Page 4, Col. 1, line 8; Page 4, Col. 1, line 46; and Page 4, Col. 1, line 57) to gather data about location (Page 4, Col. 1, line 9; Page 4, Col. 1, line30; Page 4, Col. 1, line 47; and Page 4, Col. 1, line 58) and physical properties (Page 4, Col. 1, line 38; Page 4, Col. 1, line 47; and Page 4, Col. 1, line 58) of particle defects on the wafer surface; and aligning and focusing a short pulse laser beam (Page 4, Col. 1, line 34; Page 4, Col. 1, line 49; and Page 4, Col. 2, line 25) on particle defects to cause explosive evaporation (Abstract; Page 1, Col. 2, line 31; Page 1, Col. 2, line 38; and Page 2, Col. 1, line 62) of the particle defects, the explosive evaporation comprising evaporation (Page 2, Col. 1, line 59; and Page 2, Col. 2, line 3) and fragmentation (Page 2, Col. 1, line 59; elements 212 of

Fig. 2D; and Page 2, Col. 2, line 37) of the particle defects, the aligning and focusing being performed based on the data.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Whether claims 7, 10-23 and 25-29 are unpatentable under 35 U.S.C. § 103(a) over Reinhardt (USPN 6,747,243) in view of Allen et al. (USPAP 2004/0182416 A1) and Yogev et al. (USPN 6,799,584).

VII. ARGUMENT

Rejection under 35 U.S.C. § 103(a) over Reinhardt (USPN 6,747,243) in view of Allen et al. (USPAP 2004/0182416 A1) and Yogev et al. (USPN 6,799,584).

A). Independent claim 7 and its dependent claims 10-16, independent claim 17 and its dependent claims 18-23, and independent claim 25 and its dependent claims 26-29.

Independent claims 7, 17 and 25 present a laser beam focusing and providing energy to a particle defect to cause the defect to undergo explosive evaporation, which comprises evaporation and fragmentation of the particle defect. Thus in the laser ablation process according to the present claims, the particle partially vaporizes and partially breaks into smaller particle fragments.

The present claims are patentable in view of Reinhardt, Allen and Yogev since these references each fails to teach at least an element of the present claims, namely ablating a particle defect wherein the ablating causes the particle defect to undergo explosive evaporation, which comprises evaporation and fragmentation of the particle defect.

Applicant submits that Reinhardt fails to teach evaporating and fragmentizing the particle defects using a laser beam. Reinhardt is silent with respect to evaporate and fragmentize the particle defect, and employs a laser beam to provide thermal shock (Reinhardt, Col. 11, line 37; Col. 11, lines 47-48), where the particle undergoes rapid temperature changes, generating

expansion/contraction at the contacting surfaces, reducing the adhesion of the particle to the substrate surface, and thus struck loose and may be carried away by a nitrogen flow (Reinhardt, Col. 11, lines 66-67). Thus applicant submits that Reinhardt discloses a laser process where the particle defect is removed intact, and not evaporated or fragmentized.

Further, Reinhardt teaches that the laser tool removes the particles indiscriminant of materials or composition (Reinhardt, Col. 11, line 45-46), and therefore it is not necessary to adjust or change the laser beam based on the composition of the defect. Thus applicant submits that Reinhardt teaches away from the invention of using the laser beam to evaporate the defect, since the energy needed for evaporation is highly dependent on materials or compositions.

It is appreciated that the Examiner also acknowledges that Reinhardt fails to teach explosive evaporation (Office Action dated 8/21/2007, page 3, line 8).

With regard to Allen, applicant submits that Allen is also silent with respect to evaporating and fragmentizing the particle defect. Allen discloses a process of coating the substrate surface with a transfer medium, and then using a pulsed energy beam to cause explosive evaporation of the transfer medium (Paragraph [0039], line 11). The particle defect is removed intact; only the transfer medium undergoes explosive evaporation, which lifts off the transfer medium layer together with the intact, embedded particle defect (Paragraph [0039], lines 13-14; Fig. 2C). Thus applicant submits that Allen discloses an explosive evaporation of the <u>transfer medium</u> at the substrate surface, which generates enough energy to explosively pushing the transfer medium with the intact embedded defects from the substrate surface. The explosive evaporation is not from the particles defect, and does not comprise evaporation or fragmentation of the particle defect.

The Examiner stated that Allen teaches that explosive evaporation is used to remove particles with substantial force, and that a thermal expansion velocity removes the particle. Applicant submits that the explosive evaporation process of Allen is directed toward the transfer medium/substrate interface, which lifts the transfer medium away from the substrate. The particle defect is embedded in the transfer medium and thus is removed intact with the transfer medium. Thus applicant submits that Allen teaches explosive evaporation of the transfer medium and fails to teach explosive evaporation of the particle defect, which comprises evaporation and fragmentation.

Thus applicant submits that Allen fails to teach evaporation and fragmentation of defect particle by laser ablation.

With regard to Yogev, applicant submits that Yogev is silent with respect to evaporating the particle defect with the laser. Yogev discloses coating the particles on the semiconductor substrate with a fluid and then applying suction to release and remove the particles from the surface. Yogev found that wetting the surface prior to applying suction is more effective in removing particles than applying suction alone. Yogev also discloses applying laser energy to the surface to aid in the release of the particles from the surface. There is no mentioning of evaporating the particle defect with the laser.

Further, with regard to defect fragmentation, applicant submits that Yogev teaches away from defect particle fragmentation by a laser ablation process. Yogev discloses that defect particles tend to explode during a laser cleaning process, but teaches away from defect fragmentizing by listing potential drawbacks of the particle explosion process, such as substrate surface damage upon the explosion, difficulty of removing particles and particle fragments of different contaminants and large range of sizes (Col. 2, lines 1-3). Further, Yogev discloses that his inventive process substantially reduces or eliminates particle explosion phenomena (Col. 3, lines 25-27; Col. 4, lines 42-43; Col. 5, lines 19-20). In an exemplary process, Yogev discloses that none of the silicon nitride particles exploded, as compared to a conventional laser cleaning process having more than 80% of the particles exploded.

The Examiner stated that Yogev discloses the use of laser cleaning and the explosion of a particle and fragments thereof. Applicant submits that Yogev mentions particle fragmentation, but teaches away from fragmenting particles as discussed above.

In sum, applicant submits that Reinhardt, Allen and Yogev all are silent with respect to the process of using laser beam for vaporizing the particle defect. Also, applicant submits that Reinhardt and Allen are both silent with respect to fragmentizing the particle defect, and Yogev teaches away from fragmentizing the particle defect. Thus applicant submits that the combination of these references would not render obvious the present claims of laser ablating a particle defect, causing partial evaporation and partial fragmentation of the particle defect.

Thus the present claims are patentable in view of Reinhardt, Allen and Yogev.

B). Dependent claims 10 and 11.

Applicant submits that dependent claims 10 and 11 are patentable, at least for the reason stated above with respect to the independent claim 7. Additionally, dependent claims 10 and 11 are patentable in view of Reinhardt, Allen and Yogev for the reasons stated below.

Claims 10 and 11 are directed to focusing the laser beam so that a focal point of the laser beam contacts the particle defect at a low incidence angle. The low incident angle is between about 5° to about 30° from the wafer surface (claim 11). The low incident angle potentially can reduce the damage to the wafer surface caused by the laser beam. For example, during laser ablation, a high energy plasma plume may form as a result of the rapid thermal gradient. A low incident angle can cause the high energy plasma plume to shift up and away from the wafer surface, thus reducing the damage to the wafer surface. Also, the amount of reflected energy increases with a low incident angle, thus in the event that the laser beam misses the particle, the low incident angle laser beam will direct less energy into the wafer surface.

The present claims are patentable in view of Reinhardt, Allen and Yogev since these references each fails to teach at least an element of the present claims, namely directing the laser beam so that a focal point of the laser beam contacts the particle defect at a low incidence angle.

Applicant submits that Reinhardt fails to teach focusing the beam at a low incident angle from the wafer surface. Reinhardt discloses directing a laser beam at the particle defect to remove such defect by thermal shock. Reinhardt is silent with respect to the incident angle, but Figs. 1A-1C of Reinhardt provide a 90° incident angle of the laser tool 50 when targeting the defect 40. Thus Reinhardt fails to teach focusing the beam at a low incident angle from the wafer surface.

It is appreciated that the Examiner also acknowledges that Reinhardt fails to teach the angle of incident (Office Action dated 8/21/2007, page 3, line 8).

With regard to Allen, applicant submits that Allen discloses coating the substrate surface with a transfer medium, and then directing a pulsed energy source (e.g., a laser beam) to the substrate to cause explosive evaporation on the transfer medium. Allen is silent with respect to the incident angle, but Fig. 1 shows a laser source providing laser beam 25 with high incident angle, and Figs. 3 and 4 show a 90° incident angle of the laser beam 65 from the substrate surface 55. Thus Allen fails to teach focusing the beam at a low incident angle from the wafer surface.

The Examiner stated that Allen teaches focusing the laser beam of the area of interest at approximate a 30-degree angle of incident. Actually, Allen discloses using a HeNe laser

focusing on the center of the irradiated area at ~30° angle of incident to measure the thickness of the IPA layer (Paragraph 0075, lines 13-17). This HeNe laser is not the KrF excimer laser that provides energy to the transfer medium. Thus Allen teaches focusing a different laser beam at an incident angle of 30° to measure the thickness of the transfer medium (e.g. the IPA liquid). Thus applicant submits that Allen is silent with respect to focusing a laser beam at a low incident angle to cause the particle defect to undergo explosive evaporation. It is also not obvious to a person skilled in the art to infer focusing a laser beam at a low incident angle to ablate a particle defect in view of Allen teaching of using a 30°-angle-of-incident laser to measure film thickness.

Thus applicant submits that Allen fails to teach focusing the laser beam so that a focal point of the laser beam contacts the particle defect at a low incidence angle.

With regard to Yogev, applicant submits that Yogev discloses applying laser energy to the surface to aid in the release of the particles from the surface. However, Yogev is silent with respect to focusing a laser beam at a low incident angle to cause the particle defect to undergo explosive evaporation.

Thus applicant submits that the combination of Reinhardt, Allen and Yogev does not render obvious the present claims since the prior art references of Reinhardt, Allen and Yogev each fails to teach focusing the laser beam to ablate a particle defect so that a focal point of the laser beam contacts the particle defect at a low incidence angle. Thus the present claims are patentable in view of Reinhardt, Allen and Yogev.

C). Claims 12 and 13.

Applicant submits that dependent claims 12 and 13 are patentable, at least for the reason stated above with respect to the independent claim 7. Additionally, dependent claims 12 and 13 are patentable in view of Reinhardt, Allen and Yogev for the reasons stated below.

Claims 12 and 13 are directed to focusing the laser beam to a point above the wafer surface at a distance approximately equivalent to the approximate radius of the particle defect. The distance is between about 1µm to about 10µ above the wafer surface (claim 13). Focusing the laser beam above the wafer surface can reduce the damage to the wafer surface caused by the laser beam. For example, during laser ablation, a high energy plasma plume may form as a result of the rapid thermal gradient. Focusing above the wafer surface can cause the high energy

plasma plume to be further away from the wafer surface, thus reducing the damage to the wafer surface. Also, in the event that the laser beam misses the particle, the laser beam is not focused directly on the wafer surface, thus reducing the potential damage.

The present claims are patentable in view of Reinhardt, Allen and Yogev since these references each fails to teach at least an element of the present claims, namely focusing the laser beam to position a focal point of the laser beam to be above the wafer surface at a distance approximately equivalent to the approximate radius of the particle defect.

Applicant submits that Reinhardt fails to teach focusing the beam to a point above the wafer surface. Reinhardt discloses directing a laser beam at the particle defect to remove such defect by thermal shock, but Reinhardt is silent with respect to the location of the focal point of the laser beam. Thus Reinhardt fails to teach focusing the beam to a point above the wafer surface.

With regard to Allen, applicant submits that Allen discloses coating the substrate surface with a transfer medium, and then directing a pulsed energy source (e.g., a laser beam) to the substrate to cause explosive evaporation on the transfer medium. Allen is silent with respect to focusing the beam to a point above the wafer surface. Thus Allen fails to teach focusing the beam to a point above the wafer surface.

With regard to Yogev, applicant submits that Yogev discloses applying laser energy to the surface to aid in the release of the particles from the surface. However, Yogev is silent with respect to focusing the laser to position a focal point of the laser beam to be above the wafer surface at a distance approximately equivalent to the approximate radius of the particle defect.

Thus applicant submits that the combination of Reinhardt, Allen and Yogev does not render obvious the present claims since the prior art references of Reinhardt, Allen and Yogev each fails to teach focusing the laser beam to position a focal point of the laser beam to be above the wafer surface at a distance approximately equivalent to the approximate radius of the particle defect. Thus the present claims are patentable in view of Reinhardt, Allen and Yogev.

D). Claim 18.

Applicant submits that dependent claim 18 is patentable, at least for the reason stated above with respect to the independent claim 17. Additionally, dependent claim 18 is patentable in view of Reinhardt, Allen and Yogev for the reasons stated below.

Claim 18 claims that the particle defect detector includes a low energy laser to detect the particle defects above the wafer surface and produce signals containing data about the particle defects physical properties and location. The physical properties of the particle defects can help in controlling power, time-frequency pulsing, or other electronics functions of the short pulse laser.

The present claim is patentable in view of Reinhardt, Allen and Yogev since these references each fails to teach at least an element of the present claims, namely a low energy laser to detect the particle defects above the wafer surface and produce signals containing data about the particle defects physical properties and location.

Applicant submits that Reinhardt fails to teach a low energy laser to detect the particle defects. Reinhardt employs an inspection system to optically or electronically scan the substrate surface to detect and locate the defects (Col. 8, lines 22-27). The inspection system may include optical or SEM instruments (Col. 8, lines 29-30). Reinhardt is silent with respect to a low energy laser.

Further, Reinhardt is silent with respect to detecting and producing signals containing the physical properties of the defects. Reinhardt discloses software component adapted to identify the materials or composition of each located contaminant (Col. 8, lines 64-66). However, Reinhardt discloses that the laser removes the defects indiscriminant of the material and composition of such defect, as a result of the laser beam removing the defect by thermal shock (Col. 11, lines 45-48). Thus the inspection system according to Reinhardt is unlikely to produce data about the physical properties of the defect.

With regard to Allen, applicant submits that Allen is silent with respect to a particle defect detector includes a low energy laser to detect the particle defects above the wafer surface and produce signals containing data about the particle defects physical properties and location.

Applicant also submits that Yogev is silent with respect to a particle defect detector includes a low energy laser to detect the particle defects above the wafer surface and produce signals containing data about the particle defects physical properties and location.

Thus applicant submits that the combination of Reinhardt, Allen and Yogev does not render obvious the present claims since the prior art references of Reinhardt, Allen and Yogev each fails to teach a particle defect detector includes a low energy laser to detect the particle defects above the wafer surface and produce signals containing data about the particle defects physical properties and location. Thus the present claims are patentable in view of Reinhardt, Allen and Yogev.

E). Claims 21 and 28.

Applicant submits that dependent claims 21 and 28 are patentable, at least for the reason stated above with respect to the independent claims 17 and 25, respectively. Additionally, dependent claims 21 and 28 are patentable in view of Reinhardt, Allen and Yogev for the reasons stated below.

Claims 21 and 28 claim that the processing device utilizes the data of the particle defects to compute their physical properties, which the particle defect ablator can utilize to control power, time frequency pulsing, or other electronic functions of the short pulse laser.

The present claim is patentable in view of Reinhardt, Allen and Yogev since these references each fails to teach at least an element of the present claims, namely utilizing data of the particle defects to compute their physical properties to help the particle defect ablator to control power, time frequency pulsing, or other electronic functions of the short pulse laser.

Applicant submits that Reinhardt fails to teach using physical properties of the particle defects to control power, time frequency pulsing, or other electronic functions of the short pulse laser. Reinhardt discloses that the laser removes the defects indiscriminant of the material and composition of such defect, as a result of the laser beam removing the defect by thermal shock (Col. 11, lines 45-48). Thus the ablation laser according to Reinhardt is unlikely to utilize data about the physical properties of the defect.

With regard to Allen, applicant submits that Allen is silent with respect to using physical properties of the particle defects to control power, time frequency pulsing, or other electronic functions of the short pulse laser.

Applicant also submits that Yogev is silent with respect to using physical properties of the particle defects to control power, time frequency pulsing, or other electronic functions of the short pulse laser.

Thus applicant submits that the combination of Reinhardt, Allen and Yogev does not render obvious the present claims since the prior art references of Reinhardt, Allen and Yogev each fails to teach using physical properties of the particle defects to control power, time frequency pulsing, or other electronic functions of the short pulse laser. The present claims are patentable in view of Reinhardt, Allen and Yogev.

VIII. CONCLUSION

For all the above reasons, Appellants respectfully submit that claims 7, 10-23 and 25-29 are patentable under 35 U.S.C. § 103(a) over Reinhardt (USPN 6,747,243) in view of Allen et al. (USPAP 2004/0182416 A1) and Yogev et al. (USPN 6,799,584).

Appellants respectfully request that the Board reverse the rejections on claims 7, 10-23 and 25-29 under 35 U.S.C. § 103(a) and direct the Examiner to enter a Notice of Allowance for these claims.

Enclosed is a check in the amount of $500.00 to cover the fee for filing a brief in support of an appeal as required under 37 C.F.R. § 1.17(c) and § 41.20(b)(2).

Pursuant to 37 C.F.R. 1.136(a)(3), applicant(s) hereby request and authorize the U.S. Patent and Trademark Office to (1) treat any concurrent or future reply that requires a petition for extension of time as incorporating a petition for extension of time for the appropriate length of time and (2) charge all required fees, including extension of time fees and fees under 37 C.F.R. 1.16 and 1.17, to Deposit Account No. 02-2666.

Respectfully Submitted,

BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP

Date: January 22, 2008

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IX. CLAIMS APPENDIX

1-6. (Cancelled)

7. A method, comprising:

focusing a short pulse laser beam onto a particle defect on a wafer surface; and

ablating the particle defect with the short pulse laser beam, wherein the ablating causes the particle defect to undergo an explosive evaporation, the explosive evaporation comprising evaporation and fragmentation of the particle defect.

8. (Cancelled)

9. (Cancelled)

10. The method of claim 7, wherein focusing is to direct the laser beam so that a focal point of the laser beam contacts the particle defect at a low incidence angle.

11. The method of claim 7, wherein focusing is to direct the laser beam so that a focal point of the laser beam contacts the particle defect at an angle between about 5° to about 30° from the wafer surface.

12. The method of claim 7, wherein focusing is to position a focal point of the laser beam to be above the wafer surface at a distance approximately equivalent to the approximate radius of the particle defect.

13. The method of claim 7, wherein focusing is to position a focal point of the laser beam to be between about 1 μm to about 10 μm above the wafer surface.

14. The method of claim 7, wherein the particle defect has an approximate diameter of between about 1 μm to about 10 μm.

15. The method of claim 7, wherein the particle defect has a significant portion of its volume above the wafer surface.

16. The method of claim 7, further comprising:

scanning the surface of the wafer to gather data about the location and physical properties of the particle defects; and

aligning the laser beam according to the data.

17. A system, comprising:

a particle defect detector to detect particle defects on a wafer surface; and

a particle defect ablator including a short pulse laser to cause explosive evaporation of the particle defects, the explosive evaporation comprising evaporation and fragmentation of the particle defects.

18. The system of claim 17, wherein the particle defect detector includes a low energy laser to detect the particle defects above the wafer surface and produce signals containing data about the particle defects physical properties and location.

19. The system of claim 17, wherein the particle defect detector includes a processing device to receive the signals and utilize the data.

20. The system of claim 17, wherein the processing device is to utilize the data to compute a coordinate map of the particle defects, and wherein the particle defect ablator is to utilize the coordinate map to align the short pulse laser to the particle defects on the wafer surface.

21. The system of claim 17, wherein the processing device is to utilize the data to compute a particle-properties database containing physical properties about the particle defect and wherein the particle defect ablator is to utilize the particle-properties database to control power, time frequency pulsing, or other electronic functions of the short pulse laser.

22. The system of claim 17, wherein the particle defect ablator includes a femtosecond laser.

23. The system of claim 17, wherein the particle defect ablator is to provide a pulsed laser beam to the particle defect, the pulsed laser beam having an approximate time frequency between about 50 fs to about 500 fs.

24. (Cancelled)

25. A method comprising;

scanning the surface of a wafer to gather data about location and physical properties of particle defects on the wafer surface; and

aligning and focusing a short pulse laser beam on particle defects to cause explosive evaporation of the particle defects, the explosive evaporation comprising evaporation and fragmentation of the particle defects, the aligning and focusing being performed based on the data.

26. The method of claim 25, wherein aligning and focusing is done automatically.

27. The method of claim 25, further comprising:

computing a coordinate map of particle defects according to the data; and

utilizing the coordinate map to position a focal point of a laser beam upon the particle defects.

28. The method of claim 25, further comprising:

computing a database of physical properties of the particle defects according to the data; and

utilizing the database of physical properties to control power, time frequency pulsing, or other electronic functions of the short pulse laser.

29. The method of claim 25, further comprising:

computing a coordinate map of the location of particle defects based on the data;

computing a database of physical properties of the particles defects based on the data; and

storing the coordinate map and database in memory to be utilized subsequently to cause explosive evaporation of the particles defects.

X. EVIDENCE APPENDIX

No other evidence is submitted in connection with this appeal.

XI. RELATED PROCEEDINGS APPENDIX

No related proceedings exist.